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New Media Development, Sleep and Lifestyle in Children and Adolescents

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Abstract: The number of children using portable electronic devices and the Internet has been on the increase in recent years. This study aimed to analyse how the overuse of various types of electronic devices and the Internet interfere with the sleep patterns and lifestyle of children and adolescents. This study group included 376 participants (189 girls, 187 boys) aged 6–15. The body composition estimates were obtained by means of a foot-to-foot bioelectrical impedance analysis whereas the body height was measured with the use of a stadiometer. The questionnaire survey consisted of questions concerning the children's lifestyle, new media use, eating and sleeping habits, their physical activity as well as their socio-demographic data. The correlation of the two variables was calculated with the Spearman rank correlation coefficient. Correspondingly, the odds ratio (OR) and 95% confidence intervals (CIs) were measured. This study indicated that the use of the media resulted in a significant drop in the study group's physical activity but also had a negative association with their sleeping and eating habits. In conclusion, health professionals ought to provide parents with more guidance on appropriate new media use.

Keywords: children; development; dietary patterns; new media; physical activity; sleep

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1. Introduction

The popularization of the Internet and the invention of smartphones have had a significant impact on society, especially the young users of various types of electronic devices [1]. A study conducted at the University of Colorado shows factors leading to sleep disorders in children, including increased sensitivity of the child's eyes, which may lead to sleep disorders due to the decrease in melatonin levels [2]. Short-term consequences associated with sleep problems in children and adolescents include behaviour problems, injury risk, parental stress and sleep loss [3,4]. Long-term sequelae may include obesity, later development of mental illness and school failure [5,6].

The amount of time spent in front of the screen is growing steadily and the age of the users is getting lower. Mobile devices become an integral part of a child's development environment. Despite the risks they pose, they are often treated as attractive educational tools [7]. An analysis of more than 60 studies of children and adolescents between 5 and 17 years of age found that the more screen time they spend, the greater the risk of falling asleep later, fewer hours of sleep, and worse sleep quality [8]. Scientists emphasize the need to remove digital devices from children's and adolescent bedrooms [2].

According to the recommendation of the Canadian Paediatric Society and the Canadian Society for Exercise Physiology, the daily amount of time a child can spend in front of

the screen depends mainly on their age [9]. Children under the age of two should not come into contact with the screens or monitors of various devices at all. For children aged 2–4, less than one hour a day in front of the screen is recommended, whereas the children and teenagers aged 5–17 should not spend more than two hours a day watching TV, playing computer games or communicating with friends via digital media [10]. However, research carried out shows that in the United States, school children and adolescents spend about 7 hours a day in front of a screen [11].

The Business Fiber Report of 2019 indicates that the country where users spend more than 10 hours a day online is the Philippines. In Brazil, Colombia and Thailand, this time is around 9 hours and in European countries it is between 5 and 6 hours. In turn, the Japanese spend 3 hours and 45 minutes on mobile devices, despite the fact that 94% of the population have access to the Internet. The aforementioned data indicate that it is mainly children and adolescents who use various types of technological devices [12]. The consequences of the above mentioned behaviour include, inter alia, a disorder called the vibrating telephone syndrome; that is constant checking whether the telephone rings or nomophobia (no mobile phone phobia), resulting from the fear of functioning without a telephone [13,14]. The time spent in front of the screen prompts the uncontrolled consumption of food, especially snacks and sweetened drinks high in calories, as well as limiting physical activity (PA) [15]. Thus, both the sedentary way of spending time and the increased amount of food consumption promote overweight and obesity in children. [16]. Numerous studies show that the time spent in front of the screen is directly related to an increase in body mass index (BMI) or obesity among children and adolescents and is considered a risk factor for the development of obesity [17–20]. In the past, scientists conducted research that showed a relationship between the time spent in front of a TV screen and the occurrence of overweight and obesity in children [21]. This problem concerns more and more children and adolescents, constituting a kind of burden that affects their functioning and health condition in adult life [22,23], and one recent study indicated that the more time 10-year-old girls spend on social media, the worse they rate their well-being [24].

The harmful influence of the intensive use of electronic media on the development, especially the emotional aspect, as well as the overall health of children is indicated by the health behaviour in school-aged children (HSBC) research carried out in Poland, which has been conducted periodically since the 1990s every four years in cooperation with researchers from 49 countries in Europe and North America [25]. In a review conducted by Hale and Guan, the authors showed a close relationship between screen time (TV, computer, video games and mobile devices) and delaying going to bed [8]. Moreover, younger and younger children have their own electronic devices, which they have at their fingertips in their bedrooms, completely beyond parental control [26]. Scientists agree that handheld devices delay speech development and other forms of communication in young children [27,28]. The young users, often busy with replying to received messages, do not realise the lateness of the hour, and the agitation resulting both from the chats and light from the screens causes disturbances in the daily sleep rhythm of children and adolescents [29].

In a cross-sectional study by Aurore et al. [30], a correlation was found between the use of a computer at bedtime and an increase in BMI of the examined adolescents [31]. In view of the above, the American Academy of Paediatrics (AAP) recommends that parents be vigilant and control the time their children spend in front of the screen, especially minimizing games and programs with a lot of distracting stimuli or violence. The AAP emphasizes the importance of parents/guardians accompanying the child while watching programs, being good advisers in their selection and consistently implementing the zero-screen principle of one hour before bedtime [32]. The importance of the issue is indicated by numerous actions undertaken on the initiative of scientific and medical communities presenting recommendations for families and clinicians on how to avoid the negative effects resulting from the abuse of electronic devices by children and adolescents [1].

The research undertaken can be justified by the increasing overuse of electronic devices by children and adolescents, the weakening of social ties, the resignation from PA and the widespread problem of sleep issues among children and adolescents. Carrying out the measurements among children by scientific entities is an excellent opportunity for the early detection of the overuse of electronic devices and conducting education in this field.

Given the paucity of population-level data concerning the use of new media (tablets or smartphones) and sleep problems in children, this study aimed to analyse how the overuse of various types of electronic devices and the Internet interfere with sleep, body weight composition, eating habits and the physical activity of the study group.

2. Materials and Methods

2.1. Subjects

The cross-sectional descriptive study was conducted during the 2019/2020 school year and covered all primary schools located in the one of the towns in Podkarpackie Voivodeship (southeast Poland), selected at random via a randomized algorithm program. Sample size was determined with the help of the EPI INFO (StatCalc) software. Assuming there were 165,000 pupils in the primary schools in Podkarpackie Voivodeship, we estimated that the sample should include 383 children, with a confidence level of 95% and 5% margin of error. This study was conducted in a randomly selected city. A multistage random cluster sampling method was used. The study was conducted at the turn of February and March 2020. After obtaining the consent of the city mayor and the school directors, all primary schools in the town were included in the study. These schools represent a similar profile of pupils (public schools).

The study participants and their legal guardians received both verbal and written information about the objectives as well as the possible risks and benefits of the study. After obtaining written consent from the guardians of the children, the study was conducted. All participants and guardians were fully informed verbally and in writing about the nature of this study. The study group consisted of 376 pupils (189 girls and 187 boys) aged 6–15.

The study methodology has been published in detail [33].

2.2. Assessments

2.2.1. Anthropometric Measurements and Body Mass Index

The body height was measured three times to the nearest 0.1 cm using a portable stadiometer Seca 213. The measurements were performed under standard conditions, barefoot in an upright position. The average figure of the three measurements was used in the analyses. Body weight was assessed with an accuracy of 0.1 kg using a body composition analyser (BC-420, Tanita). The body mass index (BMI) was calculated as the weight (kg)/height (m^2). Based on BMI values, the BMI percentile of the individual participants was calculated. The BMI z-score was also measured. The World Health Organization (WHO) child growth standard was adopted based on the 2007 WHO Reference which states that children aged 6 to 19 are overweight and affected by obesity with the excess weight of over 1 SD (standard deviation) and 2 SD, respectively, and underweight when under 2 SD [34]. The body composition estimates were obtained with the use of a Tanita device (BC-420). All the measurements were performed in the early morning according to the guidelines of the manufacturer with a frequency of 50 kHz. All subjects refrained from drinks and preparations containing caffeine for 48 hours and did not exercise less than 12 hours prior to measurement. Furthermore, there were the following recommendations: no excess food and drink on the day before measurement, no food and drink less than 3 hours prior to measurement, urination immediately before measurement, no measurements during menstrual period (girls).

2.2.2. Questionnaires

The authors' questionnaire was used. After obtaining the consent of the mayor of the town and the directors of all primary schools for conducting the research, we sent the

information to the pupils and their parents/guardians via electronic journal. The message contained data on the planned research and a pattern of consent for parents/guardians for their child to participate in the study. Parents who agreed to participate in the study were asked to complete an online questionnaire with their children. The older children were asked to complete the questionnaire on their own. Each parent or guardian/child received a personal survey link. The results were automatically saved to a hard disk. The questionnaire used in the study covered information concerning the children's lifestyle, eating and sleeping habits, media use and socio-demographic data. The data were collected using a survey consisting of 4 sections. The survey was designed to take approximately 25 min to complete. A food frequency questionnaire (FFQ) was also completed by participants as a part of the survey.

The first part of the questionnaire concerned the demographic data (the child's age, gender). The following questions were related to the child's sleeping behaviour such as the amount of time spent sleeping at night and during the day. There were two questions concerning the amount of sleep time during a 24-hour period on school days and the amount of sleep time during a 24-hour period at weekends. In order to calculate OR, the recommendations for the amount of sleep were used. According to the literature data, 9 hours of sleep were adopted as the norm in children.

The third part of the questionnaire concerned the use of technical devices and the Internet by children like the time they usually spend watching movies or programs on the Internet (on an iPad, tablet, computer, smartphone) or on television per day on weekdays and on weekends or the time they usually play electronic games (at a computer, game console, smartphone, iPad, etc.) per day in the weekdays and on the weekend. The questionnaire contained the following question on physical activity: Over the last week, how many days have you performed 60 minutes or more of physical activity that was enough to increase your breathing rate? This may include sport, exercise and brisk walking or cycling for recreational purposes or on the way to these places. Possible answers were 0 days to 7 days.

Food items considered in the FFQ were the major and commonly consumed food items. The FFQ was presented with a 7-point scale (how many times did you eat or drink the following food items last month?). The possible answers were: Never/ less than once a week, 1–3 times a week, 4–6 times a week, 1 time per day, 2 times per day, 3 times per day, 4 or more times per day. The individuals were asked to report the frequency of consumption over the last month.

Cronbach's α of 0.917 indicated high reliability, showing that the questions about the consumption of selected products actually assessed the nutritional behaviour of the respondents. Cronbach's alpha for the frequency of using a computer, smartphone, and games was calculated separately with the result of Cronbach's alpha 0.766. The reliability of the questions about sleep duration was also measured separately and Cronbach's alpha of 0.505 was obtained. This value was below the postulated value of 0.7, but at a satisfactory level, and the questions related to sleep assessment positively correlated with each other (in the range of 0.107–0.393). The overall power of the test was 95%, as the maximum error was 5%. For the calculation of the study power, the number of children in Poland aged 6–15 years was assumed to be 4 million [35], the reliability of the developed tools was satisfactory, and the research power was high.

2.3. Statistical Analysis

The results of the study were developed using descriptive statistics: number (N), percentage (%), mean ($\overline{x}$), median (Me), and standard deviation (SD). The dependent variables were body mass index (BMI), body composition parameters, sleep, frequency of food intake, PA. The independent variables were sex, age and media usage. The Mann–Whitney U test was used to compare differences between two independent groups. To measure the strength and direction of the association between media usage and the frequency of food intake, the Spearman rank correlation coefficient was used. The level of

significance for correlation was assumed to be $\alpha = 0.002$ (Bonferroni correction for multiple comparisons). Additionally, the odds ratio (OR) and 95% confidence intervals (CIs) were measured. The odds ratio was used to determine whether a particular exposure for the media was a risk factor for body weight category, body composition, sleep and PA. The statistical analyses were performed using PS MAGO PRO 6.0 (IBM SPSS STATISTICS 26). Statistical significance was set at $p < 0.05$.

3. Results

3.1. Characteristics of the Study Group

The study covered 376 primary school students, including 187 boys (49.7%) and 189 girls (50.3%). Among children aged 6–10, body fat (%) was significantly higher in girls (22.0) than in boys (19.6). In the 11–15 age group, it was noticed that body fat (%) was also higher in girls (23.8 vs. 15.9), while boys had higher fat-free mass values than girls (42.1 vs. 37.6) and total body water (30.8 vs. 27.5).

The majority of all respondents were children with normal body weight (N = 279; 74.2%). In the study group, 13 students (3.5%) were underweight, 72 subjects (19.1%) were overweight, and 12 students (3.2%) were affected by obesity. The descriptive characteristics of the study sample have been published elsewhere [33].

3.2. Findings

The characteristics of the new media usage in the study group are presented in Table 1. Significant differences in the time spent watching movies or programs on the Internet or TV were found between younger children (6–10 years) and older children (11–15 years). The latter often watched significantly more movies or programs on the Internet or TV on weekdays and at the weekend.

Moreover, children aged 11–15 used their smartphone significantly more often during a regular day than the younger children.

Table 1. Characteristics of media usage in the study group.

		Age (Years)	Not at all (%)	Less than 30 min (%)	30 min–2 h (%)	About 2–3 h (%)	About 3–6 h per Day (%)	More than 6 h per Day (%)	*p*
Time spent watching movies or programs on the Internet (on an iPad, tablet, computer, smartphone) or TV per day	Weekdays (h)	6–10	12.9	0.0	68.6	15.5	1.0	2.1	0.0004
		11–15	10.4	0.0	52.7	25.8	9.9	1.1	
	Weekend (h)	6–10	5.2	0.0	41.2	39.7	10.3	3.6	<0.0001
		11–15	3.3	0.0	26.9	35.2	28.0	6.6	
Time spent playing games (on computer/game console/smartphone/iPad etc.) per day	Weekdays (h)	6–10	28.9	33.0	30.4	4.1	2.1	1.5	0.1076
		11–15	26.4	26.9	32.4	10.4	3.3	0.5	
	Weekend (h)	6–10	9.8	23.2	43.3	16.5	4.6	2.6	0.6306
		11–15	17.0	19.2	31.3	15.4	13.7	3.3	
	Age (years)	**I don't have access (%)**	**less than 5 times a day (%)**	**6–10 times a day (%)**	**11–20 times a day (%)**	**21–50 times a day (%)**	**51–100 times a day (%)**	**>100 times per day (%)**	***p***
Using a smartphone on a regular day	6–10	33.5	33.0	17.5	5.7	7.2	1.5	1.5	<0.0001
	11–15	2.2	10.4	26.9	24.2	19.2	11.0	6.0	

p—*p*-value, indicates significant values ($p < 0.05$).

The relationship between media use and the frequency of food intake is presented in Tables 2 and 3. The time spent watching movies or programs on the Internet or TV by children aged 6–10 increased with the higher consumption of potatoes, carbonated sugar, sweetened drinks, diet carbonated drinks, fast food and snacks like candies or marshmallows.

The time spent playing games per day was positively correlated with carbonated sugar sweetened drinks, diet carbonated drinks, coffee and energy drinks and fast food. In addition, using a smartphone during a regular day increased with the higher consumption of most variables (e.g., coffee and energy drinks, fast food, sweets).

In the group of children aged 11–15, we observed the most correlation with playing games. With the increase in time spent playing games, the consumption of carbonated sugar sweetened drinks, ketchup, fast food, snacks and sweets also increased. Using a smartphone on a regular day was positively correlated with carbonated sugar sweetened drinks.

Table 2. Relationship between media use and the frequency of food intake in children aged 6–10.

Variables	Time Spent Watching Movies or Programs on the Internet (on an iPad, Tablet, Computer, Smartphone) or TV per Day in the Week (h)		Time Spent Watching Movies or Programs on the Internet (on an iPad, Tablet, Computer, Smartphone) or TV per Day on the Weekend (h)		Time Spent Playing Games (on Computer/Game Console/Smartphone/iPad etc.) per Day in the Week (h)		Time Spent Playing Games (on Computer/Game Console/Smartphone/iPad etc.) per day on the Weekend (h)		Using a Smartphone on a Regular Day	
	R	***p***	**R**	***p***	**R**	***p***	**R**	***p***	**R**	***p***
Potatoes (cooked)	0.246	0.001 *	0.212	0.003	0.034	0.638	0.161	0.025	0.152	0.034
Raw vegetables	0.091	0.205	0.002	0.980	–0.033	0.649	–0.087	0.229	–0.032	0.659
Fresh fruits	–0.107	0.136	–0.128	0.076	–0.184	0.010	–0.152	0.034	–0.032	0.659
Water	–0.076	0.291	0.021	0.768	–0.105	0.144	–0.019	0.788	–0.129	0.074
Fruit juices (100% fruit), packaged	0.003	0.966	–0.047	0.513	0.036	0.614	0.046	0.527	0.084	0.246
Carbonated sugar sweetened drinks	0.308	0.000 *	0.232	0.001 *	0.314	0.000 *	0.298	0.000 *	0.387	0.000 *
Diet carbonated drinks	0.275	0.000 *	0.190	0.008	0.283	0.000 *	0.269	0.000 *	0.272	0.000 *
Coffee and energy drinks	0.124	0.084	0.144	0.046	0.242	0.001 *	0.219	0.002	0.427	0.000 *
Sweetened or sugar added breakfast cereals	0.135	0.060	0.152	0.035	0.125	0.081	0.125	0.083	0.203	0.004
Plain unsweetened milk	0.037	0.604	0.040	0.583	0.000	0.995	0.001	0.986	0.111	0.123
Plain unsweetened yoghurt or kefir	–0.060	0.404	–0.120	0.095	0.041	0.574	–0.026	0.720	0.138	0.055
Sweet and flavoured yoghurt	0.129	0.073	0.080	0.267	0.065	0.368	0.048	0.506	0.084	0.245
Fish, fried and/or coated	0.120	0.097	0.055	0.448	0.122	0.089	–0.040	0.578	0.125	0.082
Fried meat (beef, pork)	0.105	0.145	0.009	0.906	0.154	0.032	0.144	0.046	0.259	0.000 *
Fried poultry	0.142	0.048	0.095	0.189	0.184	0.010	0.115	0.109	0.297	0.000 *
Ketchup	0.161	0.025	0.178	0.013	0.163	0.024	0.168	0.019	0.207	0.004
White bread, white roll, white crispbread	0.095	0.188	0.170	0.017	0.008	0.908	0.103	0.151	0.002	0.980
Whole meal bread, dark roll, dark	0.102	0.158	0.009	0.897	0.141	0.050	0.038	0.602	0.172	0.016
Fast-food	0.269	0.000 *	0.163	0.023	0.254	0.000 *	0.204	0.004	0.440	0.000 *
Snacks like crisps, corn crisps etc.	0.252	0.000 *	0.104	0.151	0.290	0.000 *	0.245	0.001 *	0.393	0.000 *
Snacks like candies, marshmallow	0.247	0.001 *	0.229	0.001 *	0.204	0.004	0.198	0.006	0.167	0.020
Snacks like biscuits, packaged cakes	0.169	0.018	0.094	0.190	0.189	0.008	0.186	0.009	0.362	0.000 *

R—Spearman's Rank correlation coefficient; *p*—*p*-value; *—indicates significant values ($p < 0.002$).

Table 3. Relationship between media use and the frequency of food intake in children aged 11–15.

Variables	Time Spent Watching Movies or Programs on the Internet (on an iPad, Tablet, Computer, Smartphone) or TV per Day in the Week (h)		Time Spent Watching Movies or Programs on the Internet (on an iPad, Tablet, Computer, Smartphone) or TV per Day on the Weekend (h)		Time Spent Playing Games (on Computer/Game Console/Smartphone/iPad etc.) per Day in the Week (h)		Time Spent Playing Games (on Computer/Game Console/Smartphone/iPad etc.) per Day on the Weekend (h)		Using a Smartphone on a Regular Day	
	R	***p***	**R**	***p***	**R**	***p***	**R**	***p***	**R**	***p***
Potatoes (cooked)	0.060	0.422	–0.015	0.843	–0.024	0.747	0.032	0.670	0.077	0.299
Raw vegetables	0.005	0.945	–0.043	0.561	–0.027	0.722	–0.063	0.395	–0.016	0.835
Fresh fruits	–0.086	0.247	–0.134	0.071	–0.107	0.149	–0.142	0.055	0.018	0.812
Water	0.055	0.464	0.057	0.446	–0.087	0.245	–0.082	0.270	0.054	0.473
Fruit juices (100% fruit), packaged	0.066	0.376	0.000	0.996	0.107	0.152	0.096	0.195	−0.004	0.961
Carbonated sugar sweetened drinks	0.347	0.000 *	0.134	0.070	0.276	0.000 *	0.287	0.000 *	0.241	0.001 *
Diet carbonated drinks	0.222	0.003	0.123	0.097	0.080	0.285	0.105	0.157	0.058	0.441
Coffee and energy drinks	–0.032	0.670	0.101	0.176	–0.033	0.658	–0.064	0.390	0.063	0.399
Sweetened or sugar added breakfast cereals	0.078	0.296	–0.096	0.197	0.205	0.005	0.096	0.195	0.098	0.189
Plain unsweetened milk	–0.020	0.791	0.037	0.621	–0.074	0.320	-0.100	0.178	–0.009	0.904
Plain unsweetened yoghurt or kefir	–0.130	0.080	–0.064	0.393	–0.179	0.015	–0.215	0.004	0.030	0.685
Sweet and flavoured yoghurt	0.065	0.382	–0.023	0.753	0.142	0.055	0.221	0.003 *	–0.069	0.355
Fish, fried and/or coated	–0.017	0.818	0.046	0.541	0.055	0.464	0.045	0.550	–0.008	0.912
Fried meat (beef, pork)	0.126	0.091	0.068	0.359	0.128	0.085	0.158	0.033	–0.020	0.792
Fried poultry	0.074	0.318	0.035	0.638	0.084	0.258	0.098	0.190	–0.056	0.450
Ketchup	0.086	0.251	0.057	0.448	0.324	0.000 *	0.342	0.000 *	0.022	0.770
White bread, white roll, white crispbread	0.140	0.060	0.158	0.034	0.041	0.586	0.083	0.263	0.102	0.173
Whole meal bread, dark roll, dark	–0.076	0.308	–0.006	0.932	–0.083	0.265	–0.116	0.120	–0.046	0.537
Fast-food	0.199	0.007	0.107	0.149	0.278	0.000 *	0.303	0.000 *	0.085	0.256
Snacks like crisps, corn crisps etc.	0.237	0.001 *	0.174	0.019	0.304	0.000 *	0.295	0.000 *	0.177	0.017
Snacks like candies, marshmallow	0.132	0.076	0.036	0.631	0.258	0.000 *	0.300	0.000 *	0.102	0.172
Snacks like biscuits, packaged cakes	0.095	0.203	0.069	0.357	0.203	0.006	0.212	0.004	0.179	0.016

R—Spearman's Rank correlation coefficient; *p*—*p*-value, *—indicate significant values ($p < 0.002$).

Children aged 6–10, who watched movies or programs on the Internet or on TV for more than 2 h a day, were 2.72-fold more likely to fail to meet the sleep recommendation during the week. For those using a smartphone more than five times a day they were 3.62-fold more likely not to meet the recommendation for sleep during the week. As far as the sleep time at the weekend, no significant results were observed (Table 4).

Table 4. Odds ratio values for sleep on weekdays in children aged 6–10.

Variables		Recommendations for Sleep (%)	Failure to Meet the Criteria for Sleep (%)	OR	95% CI
Time spent watching movies or programs on the Internet (on an iPad, tablet, computer, smartphone) or TV per day in the week (h)	<2 h	81.0	19.0	1.00	1.25–5.92
	≥2 h	61.1	38.9	2.72	
Time spent watching movies or programs on the Internet (on an iPad, tablet, computer, smartphone) or TV per day on the weekend (h)	<2 h	77.8	22.2	1.00	0.53–2.06
	≥2 h	76.9	23.1	1.05	
Time spent playing games (on computer/game console/smartphone/iPad etc.) per day in the week (h)	<0.5 h	79.2	20.8	1.00	0.66–2.60
	≥0.5 h	74.3	25.7	1.31	
Time spent playing games (on computer/game console/smartphone/iPad etc.) per day on the weekend (h)	<0.5 h	81.3	18.8	1.00	0.67–2.98
	≥0.5 h	75.4	24.6	1.41	
Using a smartphone on a regular day	<5 times per day	85.3	14.7	1.00	1.80–7.27
	≥5 times per day	61.5	38.5	3.62	

OR—the odds ratio (with 95% confidence interval).

In older children (11–15 years old), we also observed similar results in smartphone use (OR = 4.63). On the other hand, the time spent watching movies or programs at the weekend was also found to have an association with the probability (OR = 2.82) of not meeting the recommendation for sleep during the week (Table 5).

Table 5. Odds ratio values for sleep on weekdays in children aged 11–15.

Variables		Recommendations for Sleep (%)	Failure to Meet the Criteria for Sleep (%)	OR	95% CI
Time spent watching movies or programs on the Internet (on an iPad, tablet, computer, smartphone) or TV per day in the week (h)	<2 h	33.9	66.1	1.00	0.89–3.55
	≥2 h	22.4	77.6	1.78	
Time spent watching movies or programs on the Internet (on an iPad, tablet, computer, smartphone) or TV per day on the weekend (h)	<2 h	45.5	54.5	1.00	1.44–5.52
	≥2 h	22.8	77.2	2.82	
Time spent playing games (on computer/game console/smartphone/iPad etc.) per day in the week (h)	<0.5 h	29.9	70.1	1.00	0.54–1.94
	≥0.5 h	29.4	70.6	1.24	
Time spent playing games (on computer/game console/smartphone/iPad etc.) per day on the weekend (h)	<0.5 h	24.2	75.8	1.00	0.33–1.30
	≥0.5 h	32.8	67.2	0.66	
Using a smartphone on a regular day	<5 times per day	60.9	39.1	1.00	1.86–11.51
	≥5 times per day	25.2	74.8	4.63	

OR—the odds ratio (with 95% confidence interval).

Our results showed no significant relationship between media use and body weight categories. In addition, no significant influence of the media on body composition was found.

However, we found significant results when it came to PA. The younger children who played games for more than 30 min a day had a 0.31-fold greater chance of not meeting the recommendation for PA. The older children who used a smartphone more than five times per day had a 3.65-fold greater chance of not meeting the recommendation for PA (Tables 6 and 7).

Table 6. Odds ratio values for physical activity in children aged 6–10.

Variables		Physical Activity Recommendations(%)	Failure to Meet the Criteria for Physical Activity (%)	OR	95% CI
Time spent watching movies or programs on the Internet (on an iPad, tablet, computer, smartphone) or TV per day in the week (h)	<2 h	9.5	90.5	1.00	0.16–1.16
	≥ 2 h	19.4	80.6	0.44	
Time spent watching movies or programs on the Internet (on an iPad, tablet, computer, smartphone) or TV per day on the weekend (h)	< 2 h	11.1	88.9	1.00	0.39–2.34
	≥2 h	11.5	88.5	0.96	
Time spent playing games (on computer/game console/smartphone/iPad etc.) per day in the week (h)	<0.5 h	6.7	93.3	1.00	0.12–0.77
	≥0.5 h	18.9	81.1	0.31	
Time spent playing games (on computer/game console/smartphone/iPad etc.) per day on the weekend (h)	<0.5 h	6.3	93.8	1.00	0.13–1.28
	≥0.5 h	13.8	86.2	0.42	
Using a smartphone on a regular day	<5 times per day	8.5	91.5	1.00	0.19–1.12
	≥5 times per day	16.9	83.1	0.46	

OR—the odds ratio (with 95% confidence interval).

Table 7. Odds ratio values for physical activity in children aged 11–15.

Variables		Physical Activity Recommendations(%)	Failure to Meet the Criteria for Physical Activity (%)	OR	95% CI
Time spent watching movies or programs on the Internet (on an iPad, tablet, computer, smartphone) or TV per day in the week (h)	<2 h	13.9	86.1	1.00	0.48–2.96
	≥2 h	11.9	88.1	1.19	
Time spent watching movies or programs on the Internet (on an iPad, tablet, computer, smartphone) or TV per day on the weekend (h)	<2 h	18.2	81.8	1.00	0.74–4.33
	≥2 h	11.0	89.0	1.79	
Time spent playing games (on computer/game console/smartphone/iPad etc.) per day in the week (h)	<0.5 h	12.4	87.6	1.00	0.36–2.03
	≥0.5 h	14.1	85.9	0.86	
Time spent playing games (on computer/game console/smartphone/iPad etc.) per day on the weekend (h)	<0.5 h	12.1	87.9	1.00	0.35–2.14
	≥0.5 h	13.8	86.2	0.86	
Using a smartphone on a regular day	<5 times per day	30.3	69.6	1.00	1.32–10.14
	≥5 times per day	10.7	89.3	3.65	

OR—the odds ratio (with 95% confidence interval).

4. Discussion

The study indicated that the use of media resulted in a significant drop in the study group's physical activity but also had a negative association with their sleeping and eating habits.

In the literature, there are many studies dealing with media usage in school-aged children. However, few reports compare the relationship between the new media use and sleep and lifestyle among a population of healthy children. The presented problem is valuable as children are increasingly exposed to screens including both the traditional fixed screens, such as televisions and desktop computers, and more modern mobile screen media devices such as smartphones and tablets [36]. Specifically, there has been a rapid uptake in mobile screen media devices in recent years, among young children [37]. Children's dietary patterns and sleeping habits seem to be a crucial factor in weight reduction and healthy lifestyle.

In our study, we divided the group into two subgroups: children (aged 6–10) and adolescents (11–15), because age range could interfere with the results found. The Australian Department of Health recommends between 9 and 11 hours of sleep for children (aged 5–13 years) and between 8 and 10 hours of sleep for adolescents (aged 14–17 years) [38]. Sleep patterns are known to change as children enter adolescence [39]. There are also established differences in the use of new media between those two groups [40,41].

In our study, older children aged 11–15 watched movies or programs on the Internet or on TV during the week and at the weekend much more often. However, in our study, we also observed no significant relationship between new media use and BMI and body composition. This result was contrary to previous studies where a significant longitudinal relationship between the time spent on media use and increased body fat was noticed [42]. In cross-sectional studies, the results were varied. Some studies reported no evidence of a significant correspondence between media use and BMI [43]; in others, it was observed that media use seemed to be positively related with BMI for girls only [44]. This result agrees with Jabre et al. [45] who did not report a significant relationship between time spent watching TV and overweight. In addition, hours of media use were positively associated with non-healthy eating habits. It should be translated into an increase in body weight. These results are very inconsistent and suggest the need for more prospective longitudinal studies. This could help to assess the effect of media use on BMI.

The numerous scientific experiments confirm the relationship between watching TV and reduced PA in children [46]. This relationship has also been demonstrated in the studies on video games [47]. The PA among Polish children is unsatisfactory. The factors such as limited access to playgrounds, new technologies, and television contributed to its decline and increased obesity in this group [48]. In our study, the younger children who played games for more than 30 minutes a day had a 0.31-fold greater chance of not meeting the recommendations for PA and the children aged 11–15 who used a smartphone more than five times per day had a 3.65-fold greater chance of not meeting the recommendation for PA.

The higher consumption of sweets, salty snacks, fast food, fats, and lower intake of fruit and vegetables were found in children and adolescents spending a lot of time in front of the TV screen and computer monitor [49,50]. Another study looked at the positive relationship between time spent in front of the device, the number of sweet drinks consumed, and the risk of obesity. Less frequent TV watching and drinking less sweetened drinks during the day were characteristic for people with lower BMI [51]. Our results show that the consumption of potatoes, carbonated sugar, sweetened drinks, diet carbonated drinks, fast-food and sweets increased as the time spent watching movies or programs on the Internet or on TV by children aged 6–10. In the group of children aged 11–15, with the increase in playing games, the consumption of carbonated sugar sweetened drinks, ketchup, fast-food, snacks and sweets also increased. Using a smartphone in a regular school day was positively correlated with carbonated sugar sweetened drinks, snacks and sweets in children aged 6–10. In adolescents, this was also positively correlated with

carbonated sugar sweetened drinks. These results show that children who spend more time using portable media have more unhealthy eating behaviour.

Several studies have examined potential ways in which the use of traditional screen-based media can affect children's sleep. Using media in the evening may directly delay bedtime and thereby reduce the hours of night-time sleep [26]. In addition, inappropriate content such as adult programs may contribute to the psychological arousal [52] and the bright blue light emission from screens can suppress endogenous melatonin [53]. In our study, in children and adolescents, we indicated that the use of the media had a negative association with sleeping habits.

The strength of our research is taking into account electronic devices such as smartphones and tablets rather than TV and the computer. Many researchers focused on watching TV and computer use by the children, whereas children and adolescents more often use smartphones and tablets nowadays. Our findings need to be interpreted in the light of this study's several limitations. First, this was a cross-sectional study, so temporality and causality issues could not be considered. The media use could be underreported due to a social desirability bias. This study was limited in geographic scope and should be replicated among a larger sample across more regions. Another study limitation is that the parental control on overeating behaviour was not assessed. The parental behaviour may impact the likelihood that children will exhibit addictive-like eating and the amount of food they consume.

5. Conclusions

Our study confirms associations between the new media use and poor sleep, less physical activity in children and also with unhealthy eating habits that lead to weight gain and obesity. This supports the significant effects of electronic media and smartphone use on children and adolescents' lifestyle and the need to incorporate appropriate media use into sleep hygiene education and healthy lifestyle interventions. Health care professionals should provide parents with more guidance on appropriate media use. In addition, the findings may be used to improve health literacy on social media, as well as promote a positive lifestyle among children and adolescents.

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